

**REMARKS**

Claims 1, 2, 5, 7-16, 19 and 21-30 are all the claims pending in the present application.

Claims 12, 13, 25 and 26 are objected to under 37 CFR §1.75(c), for failing to further limit the subject matter of a previous claim. Claims 12, 13, 25 and 26 have been amended to clarify that each R<sup>6</sup> consists of said pendant solubility promoting moiety. Applicants believe that Claims 12, 13, 25 and 26 as amended are now in proper dependent form, and respectfully request that the objections be reconsidered and withdrawn.

Claims 1, 2, 5, 7-16, 19 and 21-30 stand rejected on prior art grounds.

Reconsideration of the Examiner's prior art rejections is respectfully requested based on the following discussion.

**I. The 35 U.S.C. §103(a) Rejection based on Sooriyakumaran et al. in view of Asakawa et al. and Bucchignano et al.**

Claims 1, 2, 5, 7-16, 19, 21-30 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sooriyakumaran et al. (US 2002/0081520 A1) in view of Asakawa et al. (5,863,699) and Bucchignano et al. (6,037,097).

The Office Action states that Sooriyakumaran et al. teaches, in his Example 3, partial protection of poly(2-hydroxy-3,3,3-trifluoropropylsilsesquioxane) with acid-cleavable trimethylsilyl group, but does not teach cyclic ketal acid-labile moiety. The Office Action argues, citing col. 12, line 36 and 41, that Asakawa et al. teaches the equivalence of the trimethylsilyl group and 1-methoxycyclohexyl group, and argues that Asakawa shows that the trimethylsilyl group and methoxycyclohexyl group were art-recognized equivalent acid-decomposable groups, and further in view of Bucchignano's alleged teaching a cyclic aliphatic ketal substituent such as a methoxycyclohexanyl group as an acid labile protecting group for an aqueous base soluble copolymer, it would have been obvious to one skilled in the art to use the methoxycyclohexanyl group as Sooriyakumaran's acid-cleavable group in his

Example 3 in order to obtain a chemically amplified resist that provides improved resist coating shelf life and with little or no vacuum effects on use and that prevents air-borne contaminants from adversely effecting the chemical nature of the aqueous base soluble copolymer. However, Applicants note that at col. 12, beginning at line 26, Asakawa et al. merely teaches that "for an acid-decomposable group, *it is possible to employ ... ethers such as (line 33) ... 1-methoxycyclohexyl ether (line 36), ... trimethylsilyl ether (line 41) ...*", and in particular, Asakawa et al. fails to teach *equivalency of ethers with ketals*.

Applicants submit that there would be no reasonable expectation of success to combine the teachings or suggestions of Sooriyakumaran et al., Asakawa et al. and Bucchignano et al. to arrive at the present invention.

Applicants first note that the present application has pointed out that there are difficulties with prior art low activation groups, including acetal, ketal and orthoesters, that have been used. For example, chemically amplified photoresist compositions based on acid labile groups comprising acetals often give rise to unpredictable results (see page 7, lines 13-25). Orthoester protecting groups are relatively highly reactive, and the shelf life of the resist product would be limited (see page 8, lines 14-15). Ketal protecting groups typically have higher reaction rates in comparison to acetal systems, for example, up to a thousand times faster, however prior art ketal protecting groups are typically linear ketal groups, which have the disadvantages of having low inhibition characteristics and relatively short shelf life (see page 8, lines 17-29) (see also Cordes et al., "Mechanism and Catalysis for Hydrolysis of Acetals, Ketals, and Ortho Estors", Chemical Reviews, 1974, Vol. 74, No. 5, pp. 593, referring to Table VI on page 592, showing ketal having a relative reactivity 2,200 greater than acetal).

Synthesizing cyclic ketal protecting groups on larger solubility promoting moieties in the structure of the present invention or Sooriyakumaran et al. is not predictable since the structure of Bucchignano et al. is different than the structure of the present invention or Sooriyakumaran et al. and will not necessarily result in the desired resist composition.

Referring to the publication by Schmaljohann et al. ("Design Strategies for 157 nm Single-Layer Photoresists: Lithographic Evaluation of a Poly( $\alpha$ -trifluoromethyl vinyl alcohol) Copolymer", In Advances in Resist Technology and Processing XVII, Proceedings of SPIE Vol. 3999 (2000), pp. 330- 334) and US Patent 5,919,597 to Sinta et al. (hereinafter "Sinta"), which Applicants have previously provided with an Information Disclosure Statement, Applicants submit as evidence that there was no reasonable expectation of success to combine the teachings of Sooriyakumaran et al., Asakawa et al., and Bucchignano et al., without undue experimentation.

In Schmaljohann et al., it was found that a protection reaction with *p*-toluene sulfonic acid as catalyst protects the acidic  $\alpha$ -trifluoromethyl alcohol groups to only a small extent, whereas more powerful neutral catalysts like ATPB give high conversion for the protection reaction (see Schmaljohann et al., page 332, Scheme 2).

On the other hand, in Sinta et al., *p*-toluene sulfonic acid is the stronger catalyst than oxalic acid or malonic acid for acid-catalyzed condensation, which can result in significant reaction exotherms and can form undesired side products. (see Sinta et al. at col. 5, lines 38-50).

Thus, in some cases, a more neutral catalyst may be the stronger catalyst (as noted by the Office Action in Schmaljohann et al.), while in other cases, a more acidic catalyst may be the stronger catalyst (as in Sinta et al.). Thus, when the structures are different, the corresponding synthesis is not predictable, and it would not be obvious to one of ordinary skill in the art to arrive at the present invention with a reasonable expectation of success, without undue experimentation.

Thus, Applicants submit that there was no reasonable expectation of success to combine the teachings or suggestions of Sooriyakumaran et al., Asakawa et al., and Bucchignano et al. to arrive at the present invention, and thus one skilled in the art would not find it obvious to modify or combine the teachings or suggestions of Sooriyakumaran et al., Asakawa et al. and Bucchignano et al. to arrive at the present invention.

Thus, Applicants respectfully request that these rejections be reconsidered and withdrawn.

**II. The 35 U.S.C. §103(a) Rejection based on Sooriyakumaran et al. in view of Asakawa et al. and Bucchignano et al. and further in view of Khojasteh et al.**

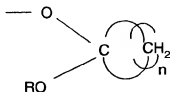
Claims 28 and 29 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sooriyakumaran et al. (US 2002/0081520 A1) in view of Asakawa et al. (5,863,699), Bucchignano et al. (6,037,097) and further in view of Khojasteh et al. (US 2002/0058204 A1).

As discussed above, there was no reasonable expectation of success and it was non-obvious to combine the teachings or suggestions of Sooriyakumaran et al., Asakawa et al. and Bucchignano et al. to arrive at the present invention.

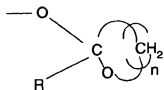
Khojasteh et al. fails to overcome the deficiencies of Sooriyakumaran et al., Asakawa et al. and Bucchignano et al., individually or in combination. As understood, Khojasteh et al. disclose compositions suitable for forming planarizing underlayers for multilayer lithographic processes are characterized by the presence of (A) a polymer containing: (i) cyclic ether moieties, (ii) saturated polycyclic moieties, and (iii) aromatic moieties for compositions not requiring a separate crosslinker, or (B) a polymer containing: (i) saturated polycyclic moieties, and (ii) aromatic moieties for compositions requiring a separate crosslinker. (Abstract)

However, Khojasteh et al., individually or in combination with Sooriyakumaran et al., Asakawa et al. and Bucchignano et al., fail to render obvious each and every aspect of the present invention. In particular, the prior art, individually or in combination, fail to render obvious a method of forming a structure on a substrate, said method comprising the steps of: providing a substrate; applying a resist composition to said substrate to form a resist layer on said substrate, said resist composition comprising resist composition comprising an acid-sensitive imaging polymer including a silsesquioxane backbone and a solubility inhibiting cyclic ketal pendant acid-labile moiety having a low activation

energy less than about 20 kcal/mol for acid-catalyzed cleaving, wherein said acid-labile moiety is cleavable at room temperature, and wherein said cyclic ketal acid-labile moiety comprises a structure of the form



or



where  $n$  is any integer from 2 to 15 and  $R$  is an alkyl or a halogenated alkyl, and wherein at least a portion of said imaging polymer is fluorinated and said imaging polymer further comprises a pendant solubility promoting moiety selected from the group consisting of a fluoroalcohol, a carboxylic acid, an amino group, an imino group, a fluorinated imino group and a fluorinated amino group, wherein said pendant solubility promoting moiety is protected with said cyclic ketal acid-labile moiety.

Thus, Applicants submit that claims 28 and 29 are patentable over the cited references, and respectfully request that these rejections be reconsidered and withdrawn.

### CONCLUSION

In view of the foregoing, Applicants submit that claims 1, 2, 5, 7-16, 19 and 21-30, all the claims currently being examined in the application, are

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patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time. Should the Examiner find the application to be other than in condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below to discuss any other changes deemed necessary. The Commissioner is authorized to charge any additional fees due or credit overpayments to Deposit Account No. 09-0458.

Applicants' undersigned attorney may be reached by telephone at (845) 894-6919. All correspondence should continue to be directed to the address listed below.

Respectfully submitted,



Todd M. C. Li  
Attorney for Applicants  
Registration No. 45,554

INTERNATIONAL BUSINESS MACHINES CORPORATION  
Intellectual Property Law Department, Zip 482  
2070 Route 52  
Hopewell Junction, New York 12533  
Facsimile: (845) 892-6363